



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/817,514	04/02/2004	Sandeep Bahl	10040093-1	3158

7590 06/02/2005

AGILENT TECHNOLOGIES, INC.
Legal Department, DL 429
Intellectual Property Administration
P.O. Box 7599
Loveland, CO 80537-0599

EXAMINER

DICKEY, THOMAS L

ART UNIT	PAPER NUMBER
----------	--------------

2826

DATE MAILED: 06/02/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/817,514

Applicant(s)

BAHL ET AL.

Examiner

Thomas L. Dickey

Art Unit

2826

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 April 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) 1-3, 5-7, 13-15, 17-19 and 25 is/are rejected.
- 7) ☒ Claim(s) 4, 8-12, 16, 20-24 and 26 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 April 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 04/02/04; 09/02/04; 04/22/05.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

Art Unit: 2826

DETAILED ACTION

1. The preliminary amendment filed on 09/02/2004 has been entered.

Oath/Declaration

2. The oath/declaration filed on 04/02/2004 is acceptable.

Drawings

3. The formal drawings filed on 04/02/2004 are acceptable.

Priority

4. Applicants have made no claim for priority.

Information Disclosure Statement

5. The Information Disclosure Statements filed on 04/02/04; 09/02/04; and 04/22/05 have been considered.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

Art Unit: 2826

A person shall be entitled to a patent unless --

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-3,6,13-15,18, and 25 are rejected under 35 U.S.C. 102(e) as being anticipated by HASE (2004/0227155).

(1) With regard to claim 25 the second embodiment of Hase discloses a tunneling suppression layer 12, comprising two or more of aluminum, gallium, indium, nitrogen, phosphorous, arsenic and antimony, specifically (in Hase's words) "InGaAsSb, InAlGaAs or InGaP, etc." Note figures 5 and 6 and paragraph 0091 of Hase.

(2) With regard to claims 1-3 and 6 the second embodiment of Hase discloses an HBT comprising a collector 3 comprising indium phosphide formed over a subcollector 2 formed over a substrate 1; a base 4 comprising gallium arsenide antimonide formed over the collector 3; an emitter 5 comprising InP (two or more of indium, phosphorous, aluminum, gallium, nitrogen and arsenic) formed over the base 4; and a tunneling suppression layer 12 between the collector 3 and the base 4, the tunneling suppression layer 12 fabricated from aluminum gallium indium arsenide (two or more of aluminum, gallium, indium, nitrogen, phosphorous, arsenic and antimony), a material that is different from a material of the base 4 and that has a graded electron affinity, x , equal to

Art Unit: 2826

or greater than an electron affinity of the material of the base 4. Note figures 5 and 6 and paragraphs 0073-0096 of Hase.

(3) With regard to claims 13-15 and 18 the second embodiment of Hase discloses a method of making an HBT comprising the steps of providing a substrate 1; forming a subcollector 2 over the substrate 1; forming a collector 3 comprising indium phosphide over the subcollector 2; forming a tunneling suppression layer 12 over the collector 3; forming a base 4 comprising gallium arsenide antimonide over the tunneling suppression layer 12; and forming an emitter 5 comprising InP (two or more of indium, phosphorous, aluminum, gallium, nitrogen and arsenic) over the base 4, wherein the tunneling suppression layer 12 is formed using aluminum gallium indium arsenide (two or more of aluminum, gallium, indium, nitrogen, phosphorous, arsenic and antimony), a material that is different from a material of the base 4 and that has a graded electron affinity, x , equal to or greater than an electron affinity of the material of the base 4. Note figures 5 and 6 and paragraphs 0073-0096 of Hase.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 2826

A. Claims 5, 7, 17 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over HASE (2004/0227155).

The second embodiment of Hase discloses an HBT with all the limitations of claims 5, 7, 17 and 19 except that the tunneling suppression layer consists essentially of $\text{Al}_{1-x-y}\text{Ga}_x\text{In}_y\text{As}$, where $0.09 \leq x \leq 0.25$, and $y=0.52$. Note figures 5 and 6 and paragraphs 0073-0096 of Hase. Note that Hase's $\text{In}_y\text{Ga}_x\text{Al}_{1-x-y}\text{As}$ tunneling suppression layer must have an electron affinity that is greater than the electron affinity of the GaAsSb base and less than the electron affinity of the InP base. Further, in their background section Hase discloses an HBT where all layers are lattice matched with InP. Note paragraph 0009 of Hase. Lattice matched layers grow with better crystallinity than non-matched layers. It would have been obvious to a person having skill in the art to set the stoichiometry of the $\text{In}_y\text{Ga}_x\text{Al}_{1-x-y}\text{As}$ tunneling suppression layer of Hase's HBT to $y=0.52$ to lattice match, such as taught by Hase in order to lattice match the tunneling suppression layer to the InP collector, and $0.09 < x < 0.25$ to keep the electron affinity of the tunneling suppression layer less than the electron affinity of the InP collector but greater than the electron affinity of the GaAsSb base, such as taught by Hase, to thus provide a tunneling suppression layer that is both lattice matched and able to gradually adjust the electron affinity from the high InP level down to the lower GaAsSb level of the base. The fact that an $\text{In}_y\text{Ga}_x\text{Al}_{1-x-y}\text{As}$ stoichiometry of $y=0.52$ lattice matches to InP is well known to those of skill in the art, as may be seen on the y axis of figure 1 on page 151 of Otfried

Art Unit: 2826

Madelung's textbook on the subject. The fact that an $\text{In}_y\text{Ga}_x\text{Al}_{1-x-y}\text{As}$ stoichiometry of $.09 < x < .25$ produces a range of electron affinities greater than (InP lattice matched) $\text{GaAs}_{.5}\text{Sb}_{.5}$ and less than InP is also well known, as may be seen on the x-axis of the same figure.

Allowable Subject Matter

8. Claims 4,8-12,16,20-24, and 26 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thomas L Dickey whose telephone number is 571-272-1913. The examiner can normally be reached on Monday-Thursday 8-6.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan J Flynn can be reached on 571-272-1915. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status

Art Unit: 2826

information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'Thomas L. Dickey', with a stylized flourish at the end.

Thomas L. Dickey
Patent Examiner
Art Unit 2826
05/05